

Application No. 09/830,434

31. (Amended) A method for polishing a semiconductor wafer, wherein a finish polishing is performed while a concentration of zinc compounds is kept to 200ppm or less in a position where the semiconductor wafer is in contact with a polishing pad.

REMARKS

Claims 11-18 and 20-31 are pending herein. By this Amendment, claim 19 is canceled. Claims 15, 17, 18, 20-29 and 31 are amended to ensure proper antecedent basis and revise grammatical informalities.

No new matter is added.

The attached Appendix includes a marked-up copy of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

I. Claim Rejections Under 35 U.S.C. §112, Second Paragraph

Claims 15 and 17-31 were rejected by the Patent Office under 35 U.S.C. §112, second paragraph as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claim 15 was rejected for allegedly using improper syntax in referencing "claims 12." Claim 15 is revised by this Amendment to recite "claim 12."

Claim 17 was rejected for allegedly containing insufficient antecedent basis for the term "the surface layer" in line 2. By this Amendment, claims 17-26 are revised to recite "the porous surface layer." Claim 17 is dependent upon claim 14 which recites "a porous surface layer." Thus, proper antecedent basis exists for amended claim 17.

Claim 31 was rejected for allegedly having insufficient antecedent basis for "the finish polishing," "the position" and "the polishing pad." By this amendment, each of these rejected terms of claim 31 are amended to "a finish polishing," "a position" and "a polishing pad," respectively. Applicants thus submit that the antecedent basis rejection of claim 31 is overcome.

Application No. 09/830,434

The Patent Office alleged that claims 20 and 21 are identical to claims 17 and 16, respectively. Applicants respectfully disagree with this assertion by the Patent Office.

Claims 17 and 20 both recite that a content of zinc compounds included in the surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer. However, claim 17 is indirectly dependent upon claim 11 which claims the limitation that "a content of zinc compounds included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad." (Emphasis added). This limitation recited in claim 11 is not set forth, either directly or indirectly, in claim 20. Thus, claim 17 is not identical to claim 20 because it contains further limitations.

Claims 16 and 21 are similar in so much as each recites that "a base layer is formed of nonwoven fabric and a porous surface layer." However, claims 16 and 21 differ in that claim 16 is dependent on claim 13 and therefore includes the limitation that "polishing pad does not include zinc compounds." Claim 21 does not claim that the polishing pad does not include zinc compounds, but that "the porous surface layer does not contain zinc compounds." Thus, claims 16 and 21 are not identical.

Claim 19 was alleged to be indefinite because it claims a content of zinc in a surface layer of less than 100ppm but depends from claim 13 which claims that a polishing pad does not include zinc compounds. By this Amendment, claim 19 is canceled. Thus, the 35 U.S.C. §112, second paragraph rejection of claim 19 is moot.

Claims 27-30 were rejected for allegedly being vague and indefinite for being unclear whether the claims are dependent claims or independent claims. By this Amendment, claims 27, 28 and 29 are amended to revise dependency to claims 11, 12 and 13, respectively. Applicants submit that claim 30 is properly dependent upon claim 20.

In view of the foregoing amendments and reasons, Applicants submit that claims 15,

Application No. 09/830,434

17-18 and 20-31 fulfill the requirements of 35 U.S.C. §112, second paragraph.

Reconsideration and withdrawal of the rejection are respectfully requested.

II. Claim Rejections Under 35 U.S.C. §102(e)/§103(a)

Claims 11-30 were rejected by the Patent Office under 35 U.S.C. §102(e) as allegedly being anticipated by, or in the alternative, under 35 U.S.C. §103(a), as allegedly being obvious over Roberts et al. (U.S. Patent No. 6,217,434). The rejection is respectfully traversed.

The present invention claims a polishing pad for polishing a semiconductor wafer in a mirror polishing process. The content of the zinc compounds included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad. (Claim 11). The present invention further claims a polishing pad for polishing a semiconductor in a mirror polishing process, wherein the polishing pad comprises a base layer formed of nonwoven fabric and a porous surface layer (Claims 14-16). The content of zinc compounds included in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer. (Claim 20).

The present invention claims that the amount of zinc compounds (e.g., ZnO) in a polishing pad should be minimized or eliminated to reduce the polishing damages allegedly created by such compounds. Prior to the present invention, it was conventional in the art to include zinc compounds in a polishing pad. For example, zinc compounds were added as fillers to better control the characteristics of polishing pad manufacturing. For example, zinc compounds increase the hardness of the nonwoven fabric constituting the polishing pad. Zinc compounds have also been added as a stabilizer against light when the polishing pad is comprised of urethane resin. (See page 14, line 24 to page 15, line 10 of the specification).

Roberts fails to anticipate, or in the alternative, render obvious, the present invention

Application No. 09/830,434

because Roberts fails to teach or suggest the present invention. Roberts describes polishing pads for the manufacture of semiconductor devices. Roberts teaches that the polishing pads comprise a random surface topography and may be formed by a process of reaction injection molding.

In particular, Roberts fails to teach limiting the presence of zinc compounds in a polishing pad to the claimed, or any other, amount. The only aspect that Roberts teaches in regards to zinc is that "Preferred catalysts are devoid of transition metals, particularly zinc, copper, nickel, cobalt, tungsten, chromium, manganese, iron, tin or lead." (See column 6, lines 3-5). Thus, Roberts teaches that, concerning zinc metal, it is preferably not present in the catalyst used to polymerize the resin of the polishing pad.

It would not have been obvious from Roberts' disclosure that zinc metal is preferably not present in the catalyst for making polishing pads, to conclude that zinc compounds, often used as fillers in such polishing pads, should be absent or present only in very small amounts in a polishing pad. Roberts teaches only that the use of zinc metal as a catalyst for the polymerization reaction is not preferred. Roberts fails to teach or suggest anything concerning the presence or absence of zinc compounds, particularly failing to teach that zinc compounds such as ZnO added as a stabilizer in the polishing pad cause polishing damages and thus should be kept to only a minimal presence at best.

Thus, one of ordinary skill in the art may understand from Roberts that zinc metal should not be used as a catalyst in manufacturing urethane and the like to form a polishing pad. However, one would not have been led to the present invention claiming that zinc compounds such as ZnO should not be used as a stabilizer against light in manufacturing urethane since Roberts fails to teach or suggest the damaging effects that can result from zinc compounds being present in a polishing pad.

Thus, Applicants submit that Roberts fails to set forth the claimed presence of zinc

Application No. 09/830,434

compounds in a polishing pad as in the present invention. Nothing in Roberts teaches or suggests having zinc compounds present in a polishing pad in amounts of 200ppm or less. Further, nothing in Roberts would have led one of ordinary skill in the art to the present invention wherein the amount of zinc compounds is limited to a small and particular range.

Applicants also submit that Figure 1 in the specification shows the unexpected results achieved when limiting the amount of zinc compounds present in the polishing pad. Both polishing pads A and B (99ppm and 78ppm, respectively, at the ratio of zinc weight relative to the weight of the surface layer of the polishing pad) had a light point defect (LPDs) of about 13.5 particles/cm² after a processing time of 120 minutes. Comparative polishing pad D had a zinc content in a surface layer of the polishing pad of 1008ppm. After a processing time of 120 minutes, comparative polishing pad D has a LPD of 27.6 particles/cm². Clearly, the present invention, limiting the amount of zinc compounds in the polishing pad, reduces the damaging effects upon semiconductor wafers. The unexpected advantage demonstrates the criticality of limiting the amount of zinc compounds in the polishing pad, further evidencing that one would not have found the present invention obvious from Roberts.

For the foregoing reasons, Applicants submit that Roberts fails to anticipate, or in the alternative, suggest, the present invention. Reconsideration and withdrawal of the rejection are respectfully requested.

III. Claim Rejections Under 35 U.S.C. §103(a)

Claim 31 was rejected by the Patent Office under 35 U.S.C. §103(a) as allegedly being obvious over Roberts in view of Applicants' admitted prior art. The rejection is respectfully traversed.

The present invention claims a method for polishing a semiconductor wafer, wherein a finish polishing is performed while a concentration of zinc compounds is present at an amount of 200ppm or less in a position where the semiconductor wafer is in contact with a

Application No. 09/830,434

polishing pad.

Roberts fails to teach or suggest the present invention. As set forth above, Roberts fails to teach or suggest a polishing pad having zinc compounds present in an amount of 200 ppm or less. Further, one of ordinary skill in the art would not have been led to the present invention by Roberts because Roberts fails to teach or suggest any advantages to limiting the presence of zinc compounds to a particular amount as in the present invention.

For the foregoing reasons, Applicants submit that Roberts fails to teach or suggest the present invention. Reconsideration and withdrawal of the rejection are respectfully requested.

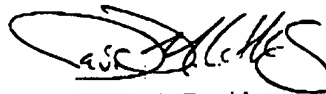
IV. Conclusion

In view of the foregoing amendments and remarks, Applicants submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 11-18 and 20-31 are earnestly solicited.

Application No. 09/830,434

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



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Attached:
Appendix

Date: February 6, 2002

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<p>DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>
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Docket No. 109352

Application No. 09/830,434

APPENDIX

Changes to Claims:

Claim 19 is canceled.

The following are marked-up versions of the amended claims:

15. (Amended) The polishing pad used for polishing a semiconductor wafer according to ~~Claims~~ Claim 12, which comprises a base layer formed of nonwoven fabric and a porous surface layer.

17. (Amended) The polishing pad used for polishing a semiconductor wafer according to Claim 14, wherein a content of zinc compounds in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the ~~polishing pad~~ porous surface layer.

18. (Amended) The polishing pad used for polishing a semiconductor wafer according to Claim 15, wherein a content of zinc compounds in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the ~~polishing pad~~ porous surface layer.

20. (Amended) A polishing pad used for polishing a semiconductor in a mirror polishing process, wherein it comprises a base layer formed of nonwoven fabric and a porous surface layer, and a content of zinc compounds included in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer.

21. (Amended) The polishing pad for polishing a semiconductor wafer according to claim 20, wherein the porous surface layer does not include zinc compounds.

22. (Amended) The polishing pad for a semiconductor wafer according to Claim 14, wherein the porous surface layer is ~~foamed~~ formed of foamed polyurethane.

23. (Amended) The polishing pad for a semiconductor wafer according to Claim 15, wherein the porous surface layer is ~~foamed~~ formed of foamed polyurethane.

Docket No. 109352

Application No. 09/830,434

24. (Amended) The polishing pad for a semiconductor wafer according to Claim 16, wherein the porous surface layer is ~~foamed~~ formed of foamed polyurethane.
25. (Amended) The polishing pad for a semiconductor wafer according to Claim 20, wherein the porous surface layer is ~~foamed~~ formed of foamed polyurethane.
26. (Amended) The polishing pad for a semiconductor wafer according to Claim 21, wherein the porous surface layer is ~~foamed~~ formed of foamed polyurethane.
27. (Amended) A method for polishing a semiconductor wafer, wherein the polishing is performed by using the polishing pad according to Claim ~~21~~ 11.
28. (Amended) A method for polishing a semiconductor wafer, wherein the polishing is performed by using the polishing pad according to Claim ~~22~~ 12.
29. (Amended) A method for polishing a semiconductor wafer, wherein the polishing is performed by using the polishing pad according to Claim ~~23~~ 13.
31. (Amended) A method for polishing a semiconductor wafer, wherein ~~the~~ a finish polishing is performed while a concentration of zinc compounds is kept to 200ppm or less in ~~the~~ a position where the semiconductor wafer is in contact with ~~the~~ a polishing pad.